

# **Action Needed to Reduce the Harm from the Continuous Leak in Hanford's Leaking Single Shell High-Level Nuclear Waste Tank B-109:**

The Harm is Greater Than Disclosed  
Options Are Readily Available to Meet the Legal Requirement to Remove Waste  
Time is of the Essence

Presented to the Hanford Advisory Board Tank Waste Committee

August 11, 2021

Heart of America Northwest Tribal & Environmental Law Externs

Mary Bent, Alex Goldman, Kylee McGill, Henry Mueting (Seattle U Law JD candidates)

Supervised by Gerry Pollet, JD; Executive Director; Adjunct Professor of Law



## Hanford meetings should start with a land acknowledgement

Treaties of 1855 RESERVED the rights to the lands and resources which USDOE has contaminated:

*“the exclusive right of taking fish in the streams running through and bordering said reservation is hereby secured to said Indians, and at all other usual and accustomed stations in common with citizens of the United States, and of erecting suitable buildings for curing the same; the privilege of hunting, gathering roots and berries and pasturing their stock on unclaimed lands in common with citizens, is also secured to them”* (Umatilla, Cayuse and Walla Walla)

## Agenda

- B-109 Background and Current Status
- DOE and Ecology's publicly stated lack of intent to take action to address B-109 and mitigate risks
- DOE ignored its own monitoring data showing leak and for calculating amount leaked – slide 10
- DOE did not share with public Gamma borehole logging showing leak very serious – slide 17
- DOE/Ecology Approach is Unacceptable to Stakeholders and Native American Tribes – slide 19
- Regulatory Framework Establishes Mitigation Requirements – slide 20
- A proposed, workable approach to mitigate B-109 harm and remove liquid – slide 23
  - In-tank waste retrieval, pretreatment, post treatment and off-site disposal
  - Regulatory Approach
  - Cost, Schedule and Benefits
- Proposed Policy Level Hanford Advisory Board (HAB) advice – slide 34
- Questions/Answers
- Backup slides on In-Tank Pretreatment System Slide 37 on

April 29, 2021 USDOE announces that another High-Level Nuclear Waste Tank (B-109) is leaking

## US: Nuclear waste tank in Washington state may be leaking

By NICHOLAS K. GERANIOS Associated Press Apr 30, 2021 Updated Apr 30, 2021 0



SAFEWAY

Use your  
rewards number  
at the pump and  
save up to  
\$1/gallon.

[Learn More](#)

Redeem Rewards at participating  
stations. \*Terms & conditions apply.

LATEST E-EDITION

WEEKEND EDITION  
BARCE ANNOUNCES FORUMS: HERMISTON'S ADDRESS  
FOR PRESIDENTIAL FINALISTS: AMONG MCCLENNIS  
MAY 10, 2021



HANFORD

## Aging Hanford **tank** is **leaking** radioactive waste into the ground, feds say

Quantity Released: ~3100 gallons

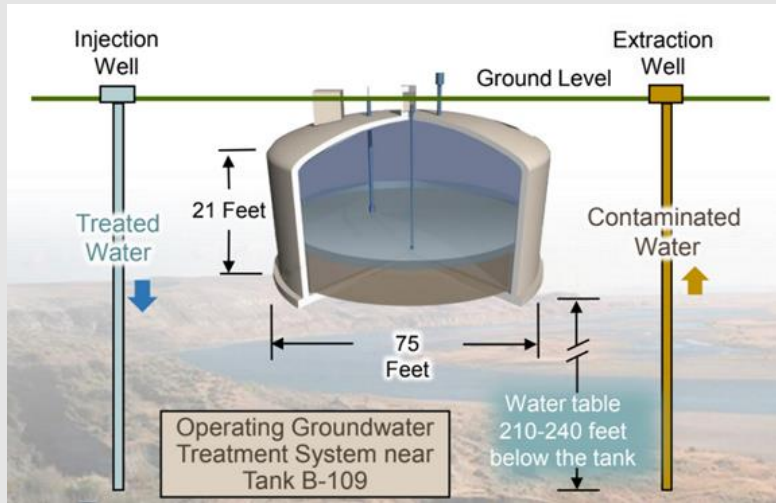
APRIL 29, 2021, 9:00 AM

## URGENT - Action Needed To Prevent Further Leaks from Tank B-109

The text below is from USDOE's official report of the leak from Tank B-109 and public statements.

The B-109 tank leak does not represent an increased health or safety risk to Hanford workers or the public. Safely managing all Hanford tank waste is a top priority for DOE. When it comes to the overall long-term tank waste mission, DOE continues to focus on safe, efficient and effective tank waste treatment capabilities.

# Leaking Tank B-109



123,000 gallons of High-Level Nuclear Waste with an estimated 15,000 of pumpable liquids

USDOE:

- “no increased health or safety risk,” so NO effort to remove waste to stop the leak

- Can rely on pumping and treating groundwater after the contamination moves through the soil column.
- Contamination likely to start reaching groundwater in around 25 years, and would keep contaminating it for thousands of years

**Washington Governor Inslee had announced a  
“Zero Tolerance Policy” for Leaks, but NO  
Action Planned More Than 2 Years After the  
Leak Was Obvious**

8 years ago, when the US Department of Energy admitted other tanks were leaking, Governor Inslee said: *“Washington state has a **zero tolerance policy** on radioactive leakage. We will not tolerate any leaks of this material into the environment.”*

- B-109 much closer to Columbia River than tanks in 200 West (T Farm) and leaking more

Now, another tank is leaking – 8 years ago, Governor Inslee announced a “Zero Tolerance” policy for leaking tanks at Hanford

- Leaks from Tank B-109 will move to the groundwater in as little as 20 years and flow to the Columbia River. Tank leaks will recontaminate groundwater and the River over and over for thousands of years. **Where’s the urgency and action from Washington’s “Zero Tolerance Policy”?**
- USDOE’s Brian Vance: **USDOE not planning to do anything but let the tank leak – called it “small” compared to past dumping**
- Federal and state hazardous waste laws require emptying a leaking tank immediately or as soon as feasible\*
- Resources essential to culture and health from groundwater to plants to River, which are protected by Treaty rights, are irreversibly harmed.



## With a Zero Tolerance Policy for Leaks from High-Level Nuclear Waste Tanks, What Action?



- April 29, 2021: USDOE announced that another Single Shell Tank is leaking. B-109 is in 200 East. USDOE estimated it is leaking about 1,300 gallons a year – more than the tanks in 200 West.
- B-109 and 200 East are much closer to the Columbia River.
- Contamination may reach groundwater in 20 years, and flow to the River. It would continue to contaminate the River for 10,000 years.

# Failure to Report the Leak: USDOE's monitoring of Interstitial liquid level showed clear evidence of leak

- The precipitous drop in Interstitial liquid level from December 2018 to March 2019 required USDOE to report the evidence of this leak immediately to EPA & Ecology and removal of waste. Loss of 4.09 gallons / day, > 120 gallons/month.
- USDOE reported 4-29-21
- Drop in liquid level March 2016 should have triggered review if not report of suspected leak

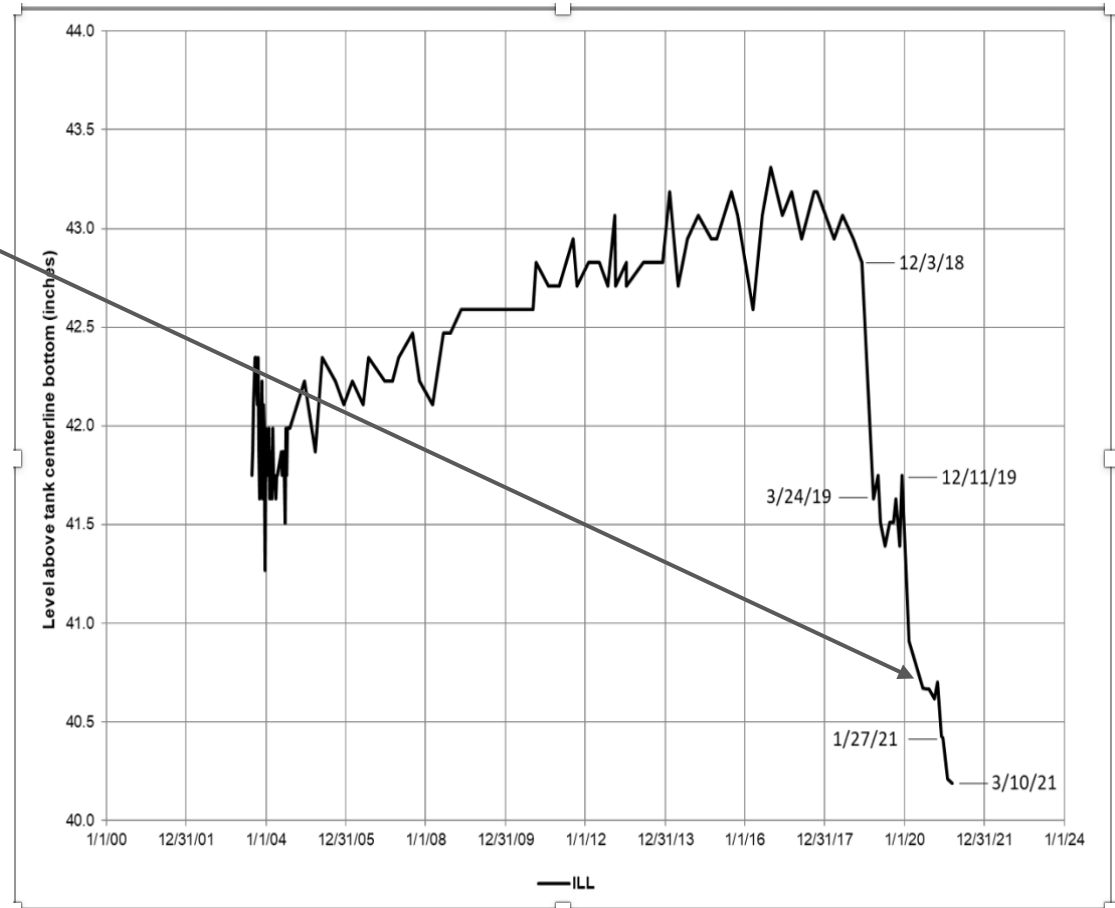


## Federal and State Hazardous Waste Laws Require Immediate Reporting of Leak and Removal of Waste to Reduce Harm

- DOE has known about the B-109 leak for over two years - A leak was likely seen in early 2017; early 2019 precipitous drop required report
- Delay in reporting = Delay in Action = Irreversible Harm
  - “[a]ny release to the environment must be reported to the department and other authorities immediately.” Wash. Admin. Code.173-303-640(7)(d)
  - Federal law similarly requires that the owners and operators of tanks must, within 24 hours, “[r]eport the release to the implementing agency.” 40 C.F.R. § 280.61.
- No action has been taken or is planned for removing the interstitial liquid/supernatant waste from the tank
- This is a clear violation of the duty to “remove as much of the waste as is necessary to prevent further release of dangerous waste to the environment.” Wash. Admin. Code.173-303-640(7)(b)(i).

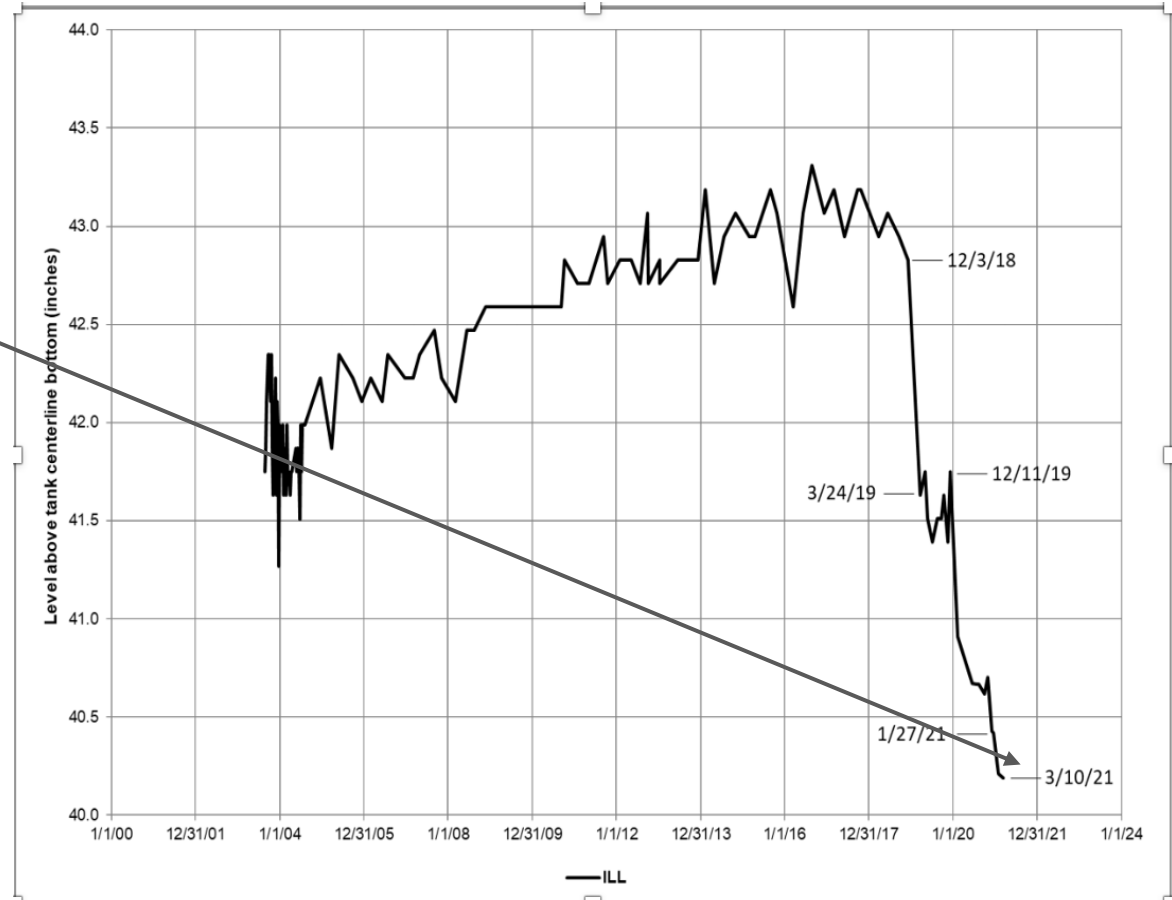
# Failure to Report or Even Start Assessing the Leak:

- In July 2020, the USDOE started their Formal Leak Assessment (FLA) **after a 17-month** sharp decrease in Interstitial Liquid.
- Leak Assessment Team took another three months before holding a second meeting. Met only 3 times in seven months.



## Leak Obvious for Over 2 Years Prior to Reporting

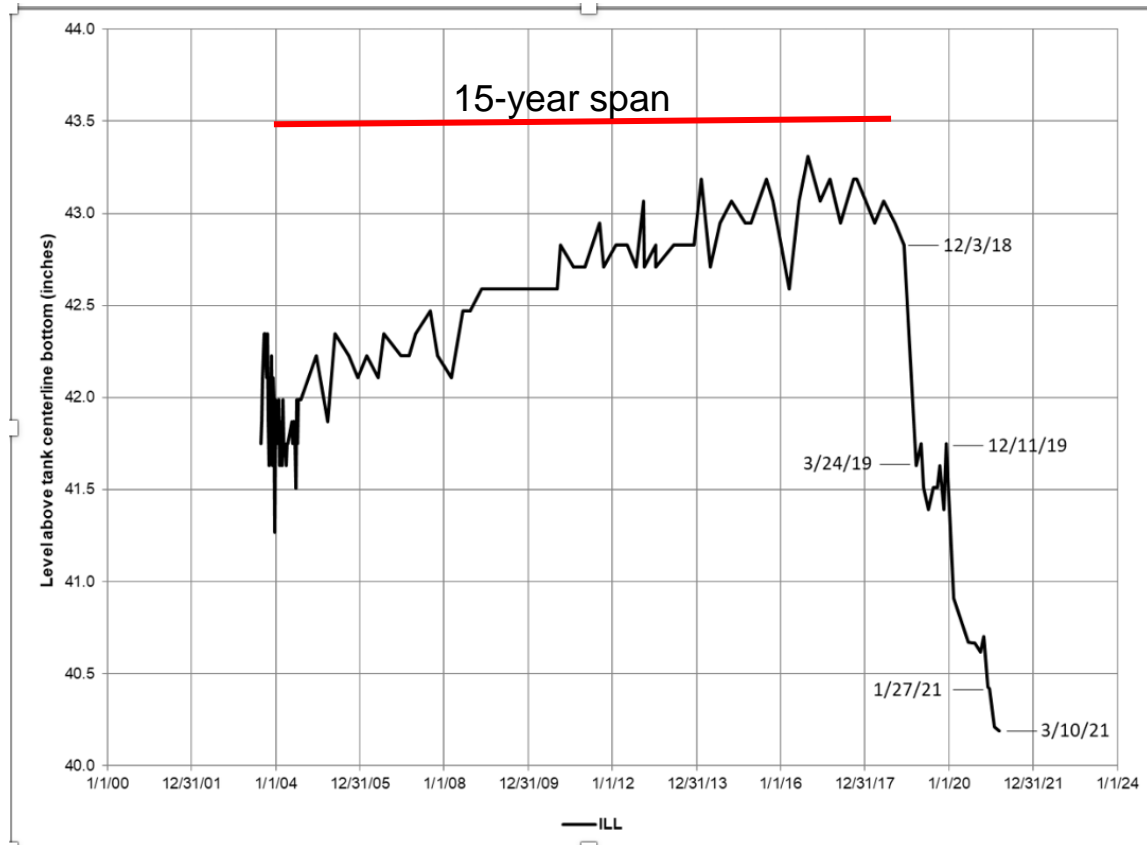
- USDOE's issued its formal notice and completion of their FLA in April 2021. The report also estimated only 3,100 gallons leaked. **Actual waste leaked is 180% to three times greater = from 5,750 to 10,000 gallons.**
- USDOE's own monitoring data shows they knew or should have known of the B-109 leak by March 2019, at the latest. Should have known started assessments 2017 or 12-18.
- Formal Leak Assessment began 17 months after USDOE had clear evidence of a leak. It was not completed until April 29th, 2021 - two years late.



# USDOE Misrepresented the liquid level inside tank B-109

## Much more waste has leaked from B-109 than reported

- USDOE reported the same level of DIL during this 15-year span in the Waste Tank Summary reports, despite a clear increase in liquid level.
- If there were no leaks the level would be up at 43.5 inches.
- B-109 will keep gaining liquid because if the nature of the High-Level waste's chemical properties. Waste is hygroscopic – it attracts and entrains moisture.
- USDOE reported in 2014 that water was also entering the tank = “intrusion.”

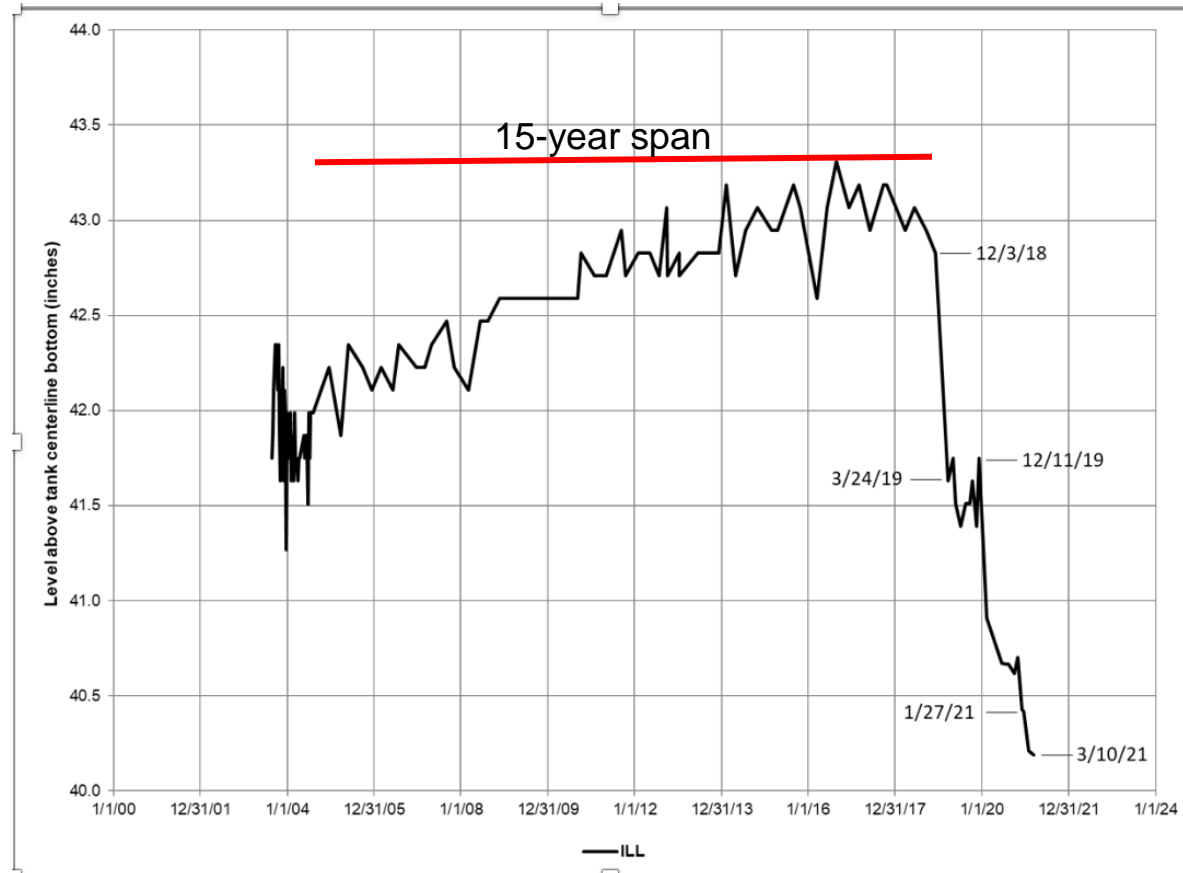


## Misrepresentations of Liquid in Tank and Ignoring Regular Gain of Liquid Led to Greatly Underreporting the Leak (Continued)

The Waste Tank Summary Reports fail to accurately report increasing levels of DIL for over 15 years prior to the leak.

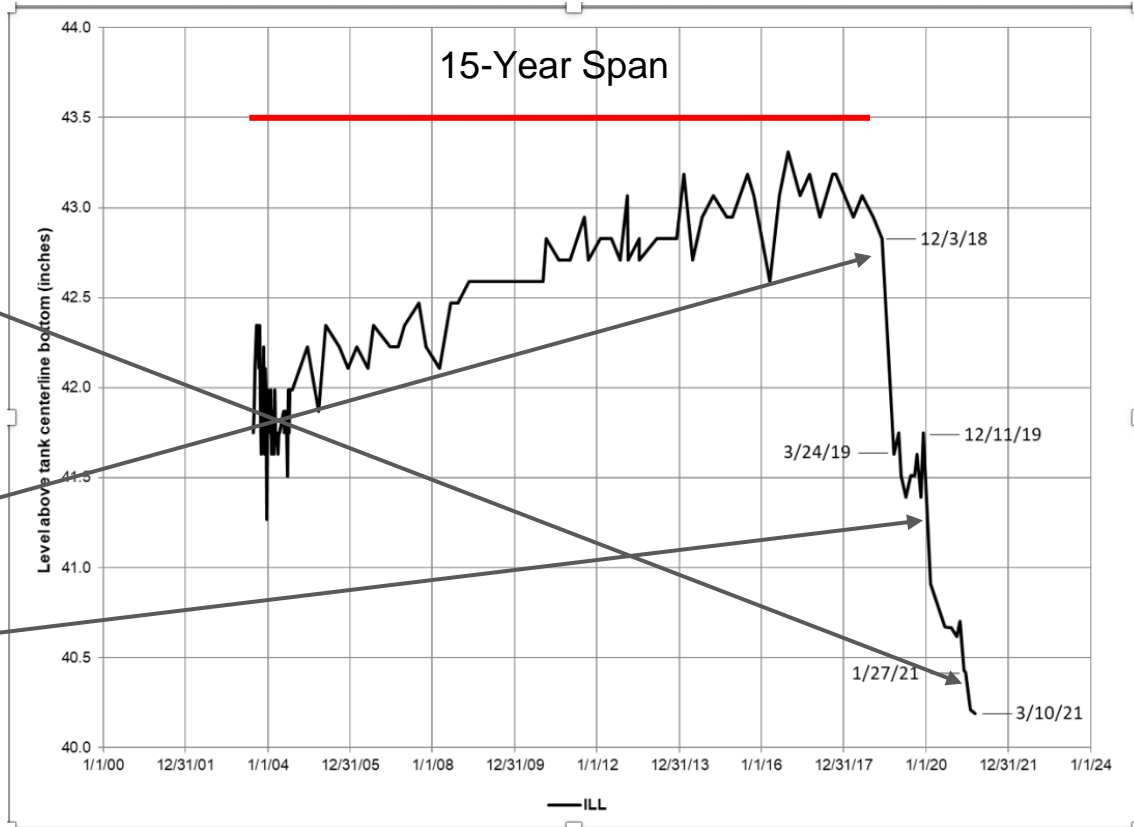
USDOE reported only 3,100 gallons leaked. Total waste leaked from Tank B-109 is at least 5,750 gallons, and as much as 10,000 gallons.

USDOE only measured loss from the measured December 2018 level – disregarding how much liquid is entrained every month and clear evidence of leakage prior to 12-2018\*



# Big Picture

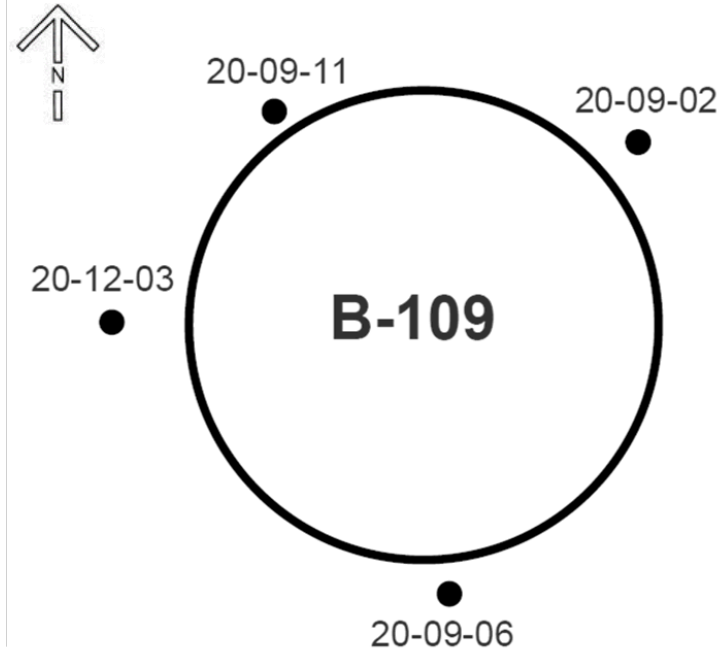
- USDOE's issued its formal notice and completion of their FLA in April 2021. The report also estimated only 3,100 gallons leaked, where in reality the true amount of liquid leaked ranges from 5,750 to 10,000 gallons.
- In December 2018, USDOE was required to report the evidence of this leak immediately to Ecology to begin the process of removing leakable waste.
- In July 2020, the USDOE started their FLA **after a 17-month** sharp decrease in DIL.
- USDOE reported the same level of DIL during this 15-year span in the Waste Tank Summary reports, despite a clear increase in liquid level.





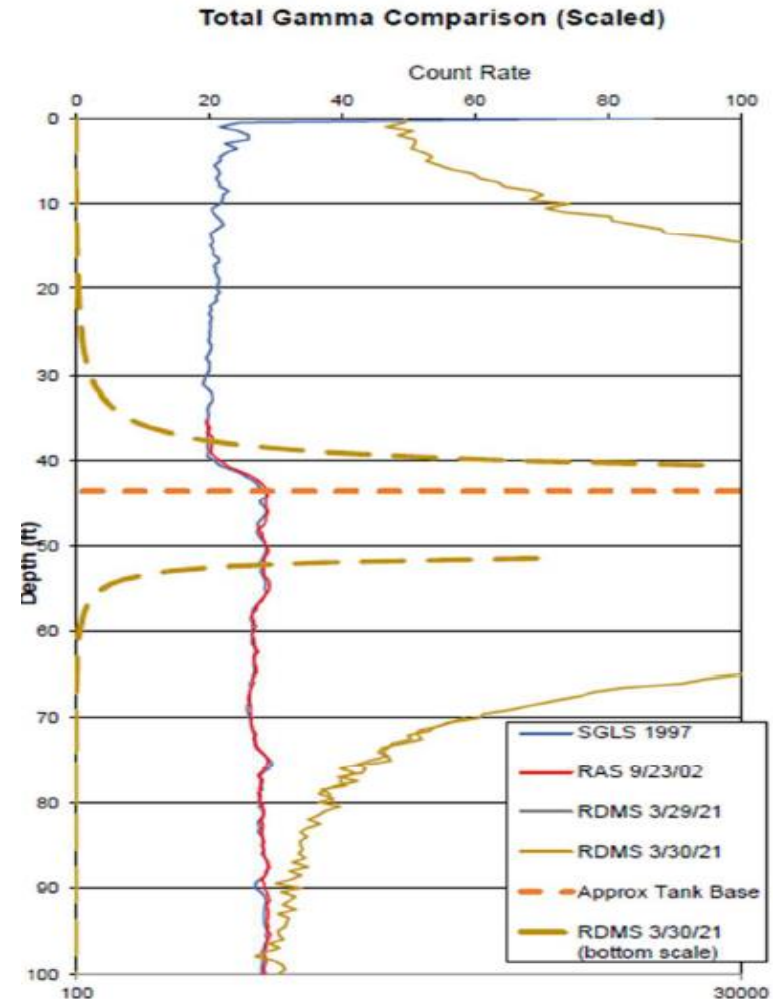
# USDOE did not disclose to the public and in required leak report that Gamma Borehole logging confirmed the leak

- Gamma radiation logging of boreholes to definitively determine if there was a leak should have been required immediately when a leak assessment began.
- Instead, it wasn't requested till March 2021.
- It confirmed **very high** Gamma radiation levels since last borehole logging in 2002 in borehole -06 (Southern side of tank).
- Other 3 boreholes showed no increase since last logged. Leak is only reasonable explanation for the new contamination.



USDOE did not disclose to the public and in required leak report that Gamma borehole logging shows leak serious and moving

- “The gamma activity count rates at this drywell were elevated for nearly the entire length of the drywell, with peak count rates occurring at 41 ft.(~41,000 cps) and at 51.5 ft. (~21,000 cps) below the top of the casing. Between these depths, the detector was saturated, indicating count rates greater than 55,000 cps and a potential leak from Tank B-109.”
- Contamination already > 50-65’ below top
- Groundwater approximately 200 foot below

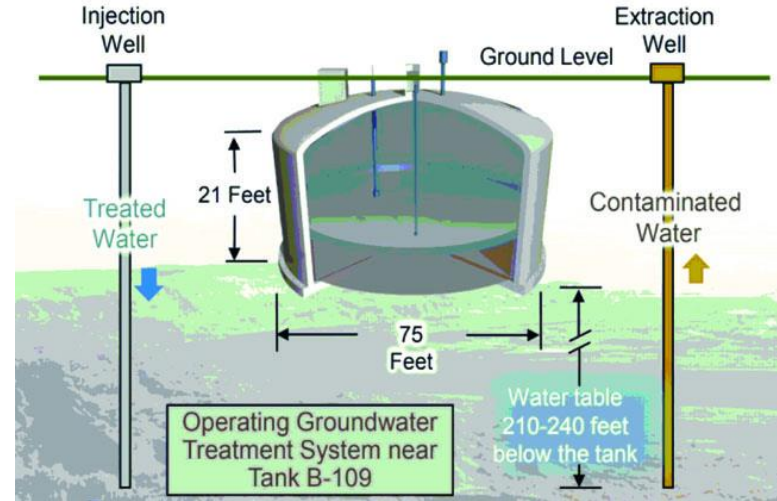


# DOE/Ecology Approach is Unacceptable to Stakeholders

- Shows USDOE's acceptance of soil contamination from tank leaks and discharges
- A direct affront to the Tribes whose homeland is being contaminated without voice or input
- Demonstrates a lack of urgency and concern
- Demonstrates a lack of will by DOE/Ecology to enforce regulatory requirements or to invoke approaches to try and mitigate issues when discovered
- Defies reality that USDOE can never remove all contamination from groundwater, and that contamination will move from soil to groundwater over thousands of years.
- There has been no discussion with the public and Tribes about acceptability of the stated "do nothing" strategy by DOE management

# Tank B-109 Leak Response

- The State has the authority and duty to order USDOE to “remove” leakable liquid and waste in response to the B-109 leak crisis.
  - RCRA and State HWMA authority
- This could be a CERCLA removal action per 40 C.F.R. § 270.61
  - When there is a release or threatened release, removal action appropriate.



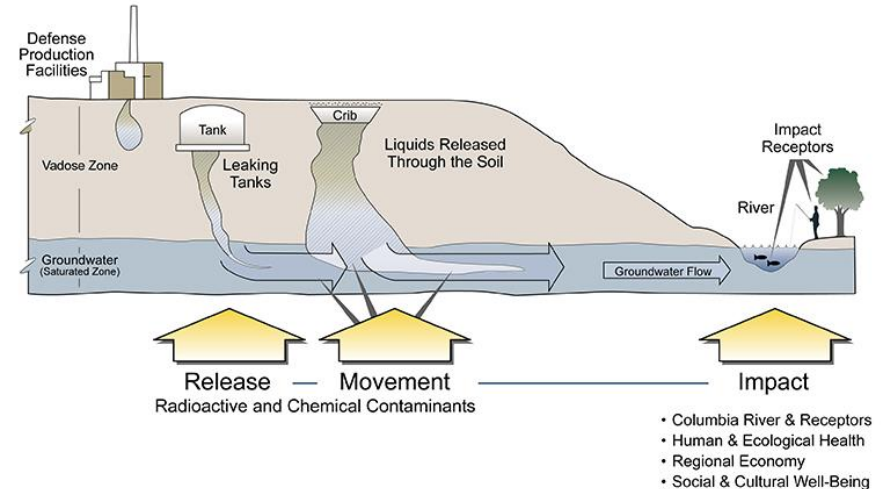
The Department of Ecology has the authority and duty to order the Department of Energy to immediately remove waste from B-109 to abate the “imminent” and “substantial endangerment” posed by leaking High-Level Nuclear Waste.

- “Imminent” and “substantial endangerment” includes long-term harm to health and the environment that we know occurs from a leak of High-Level Nuclear Waste.
  - Claims that this leak is “small” compared to past releases does not change the duty to abate the harm



# To apply available options for removing leakable liquid:

- The Federal Resource and Conservation Recovery Act (RCRA) and state hazardous waste law (HWMA) allow for the Department to waive permit applications during an emergency to human health or the environment to remove waste from B-109. The leaking tanks at Hanford are a threat to both human health and the environment.



# Removal of Waste from B-109 could begin in months

- The Department of Ecology has a duty to require the Department of Energy to remove drainable waste from B-109 as soon as possible. There are available technical options using the SAFE and TBI equipment and technologies to remove the waste. Removal could begin within months.
- Development and testing of the In-Tank Pretreatment System (developed for TBI) with SAFE offsite treatment proposal, using saltwell pumping with ion exchange, may proceed either under a RD&D permit or as an urgent removal action with an RD&D permit following an initial test.





# Available mobile, low cost, timely option for retrieving leakable liquids from leaking Tank B-109

- B-109 will continue to leak unless liquids are removed.
- Liquids that leak from B-109 carry high Gamma radionuclides into soil as shown in Gamma drywell monitoring at B-109 (March 2021) with peak radiation levels 41 to 51 feet below surface.
- Uses an In-Tank Pretreatment System = ITPS
- Components already developed and delivered
- Low cost
- Ion exchange is in the assembly put into the tank.
- Allows removal of Cesium, Strontium, TRU before waste exits tank.
- Ion exchange similar to TSCR.
- Mobile – double contained transfer lines to transport.
- Demonstrate offsite treatment to RCRA standards and use as test of TBI.
- Move to next leaking tank...





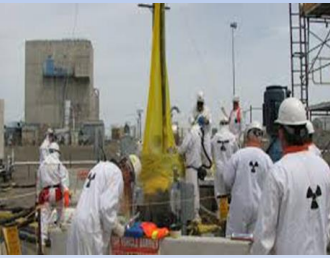
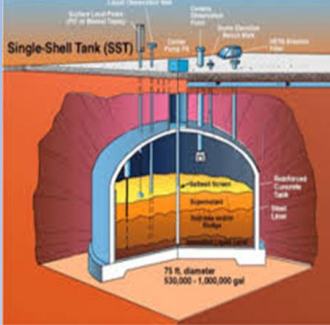
# A Workable, Regulatory Compliant Approach To Mitigate B-109 Leak Can Start in Months

- Step 1: Install Ex-tank leak detection system
  - Determine baseline extent of conditions:
    - Characterize and report on status of contamination plume
- Step 2: Removal, Treatment And Disposal of Leakable Interstitial Liquid Waste
  - Mitigate further leaks from water ingress
- Step 3: Monitor Effectiveness of Mitigation Plan
  - Use in-tank and ex-tank leak detection systems and treated fluids to monitor and report on mitigation plan effectiveness

# In-tank waste retrieval, pretreatment, post treatment and off-site disposal

- Little infrastructure is available at B-109 to support an intermittent waste transfer campaign
  - Simple, low volume modular systems required
- DOE has available a tested In-tank Pretreatment System (ITPS) developed as part of the Test Bed Initiative program
  - Deployed through an existing or a new tank riser
  - ITPS is designed to retrieve, filter and remove cesium from tank liquids at the rate of 1 GPM
    - It is a small-scale analog of DFLAW's TSCR system
    - Can treat up to ~2000 gallons of waste before replacement
  - Resulting liquid exiting the ITPS can then be transported to offsite treatment to meet all LDR standards and offsite disposal. Meets same criteria as TSCR.

**Easy to install system  
in riser of B-109 to  
retrieve liquids before  
they leak**



## **Tank B-109 Waste Retrieval and Pretreatment Key Features**

### **Key Features**

Approach is like the one used for interim stabilization of SSTs (i.e. removal of liquids)

- USDOE has greatly improved salt well pumping capability – put pump and salt well into B-109 and can retrieve far more liquid than when tanks were interim stabilized 20+ years ago.
- Leverages systems and components already developed and tested for a similar application in other tanks
- Allows retrieval and pretreatment of ~2000 gallons of interstitial liquid waste before it can leak to the environment
- If demonstration of first 2000 gallons of interstitial liquid waste is successful, continue to remove all interstitial liquid from B-109.
- Low personnel, operations and environmental risk
- Pretreatment of the liquids is done inside the tank, simplifying operational and nuclear safety evaluations
- Lab analysis of retrieved waste is verified to be MLLW before treating to RCRA standards followed by out of state disposal
- Big benefit – waste is not disposed in Hanford IDF landfill and is first reduction in total on-site contaminant load
- Approach enables DOE to have a ready and tested means for addressing future SST tank leaks as infrastructure continues to age and more tanks leak
- When ion exchange resin is expended, it gets pulled out and a new ITPS installed. Cost approximately \$150,000.

# 241-B-109 ITPS

## Key Features and Benefits

- Leverages components previously deployed in high level waste applications
- Enables mitigation of leak risk in Tank 241-B-109
- Allows safe, cost effective retrieval and pretreatment of 2,000 gallons of mixed low-level waste (MLLW) while regaining interim stabilized status
- Low personnel, operations and environmental risk
- Riser extension maintains tank containment and allows for sampling – any leak gravity-drains back to tank
- System is a rigid assembly installed in a single 12" riser in a single lift
- IX column is in riser, simplifying operational and nuclear safety evaluations
- Filtration in-line before Ion Exchange (IX ) column protects column
- MLLW to delay tote for IX performance confirmation measurement then to DOT approved tote, with secondary containment shielding

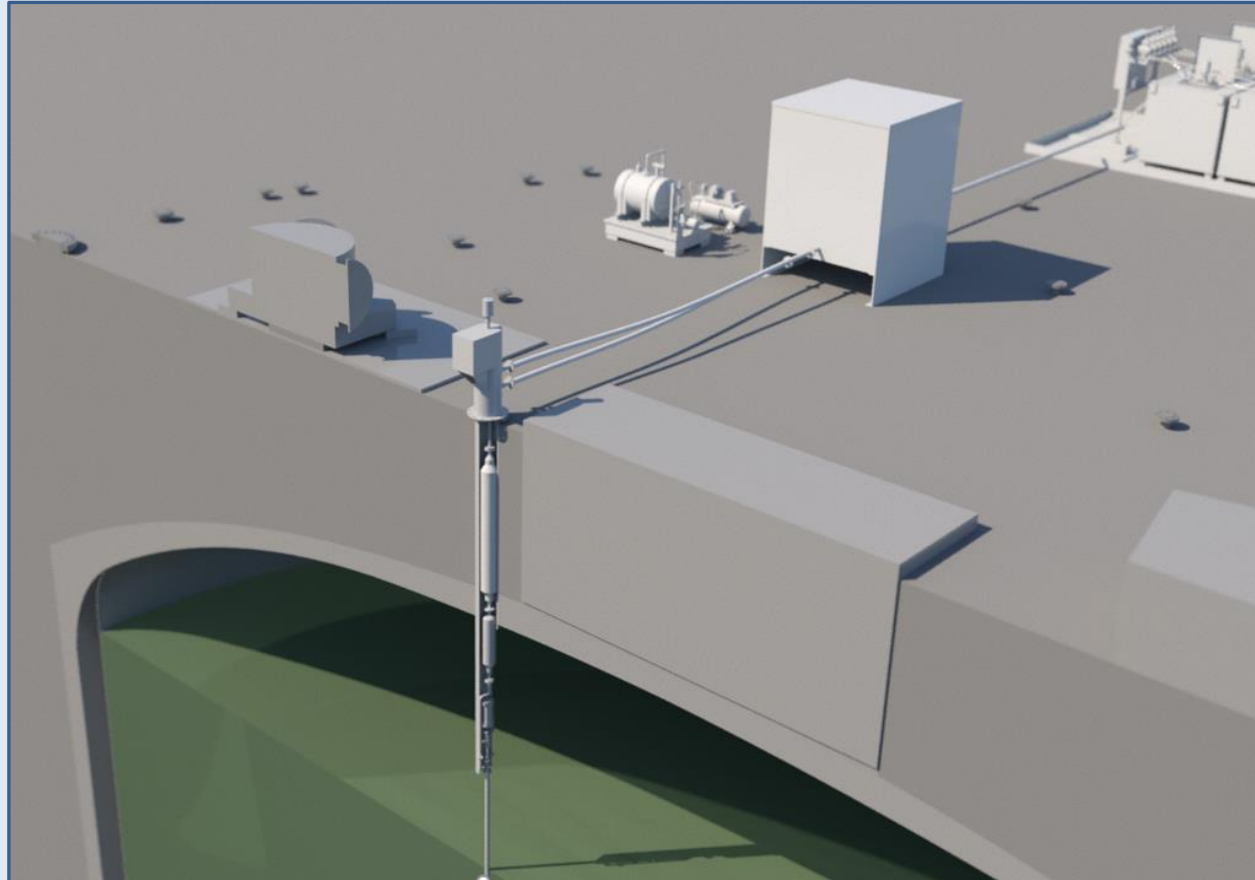


### In-Tank Pretreatment System Design



1. NucFil filter for hydrogen venting contamination control
2. 12" riser adapter with line out to transport totes and line in for backflush and venting of loaded IX column
3. Decontamination spray ring reduces contamination/dose in decommissioning
4. Ion exchange column w/CST resin separates  $\approx 175$  Ci Cs-137. Designed for decoupling and interim storage or disposal
5. Back-flushable cartridge filter to remove actinides and protect IX column
6. DC progressive cavity pump feeding system at approximately 1 gpm
7. Inlet strainer set into waste

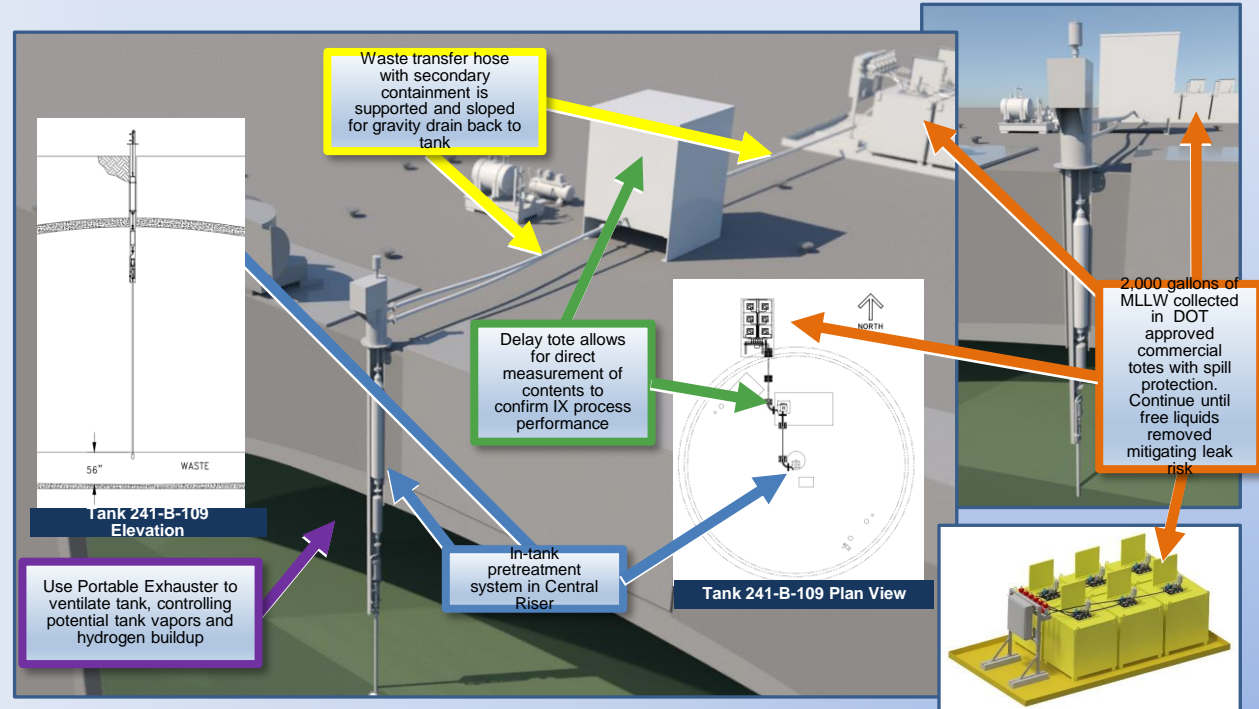
### Tank B-109 Field Deployment Concept



## In-Tank Pretreatment System Design

1. NucFit filter for hydrogen venting contamination control
2. 12" riser adapter with line out to transport totes and line in for backflush and venting of loaded IX column
3. Decontamination spray ring reduces contamination/dose in decommissioning
4. Ion exchange column w/CST resin separates  $\approx 175$  Ci Cs-137. Designed for decoupling and interim storage or disposal
5. Back-flushable cartridge filter to remove actinides and protect IX column
6. DC progressive cavity pump feeding system at approximately 1 gpm
7. Inlet strainer set 1-2 feet into waste

## Tank 241-B-109 Field Deployment Concept



## Key Features

- Components previously deployed in high level waste applications
- Allows safe, cost effective acquisition of 2,000 gallons of mixed low-level waste (MLLW) while mitigating leak potential and regaining interim stabilized status
- Low personnel, operations and environmental risk
- Riser extension maintains tank containment and allows for sampling – any leak gravity-drains back to tank

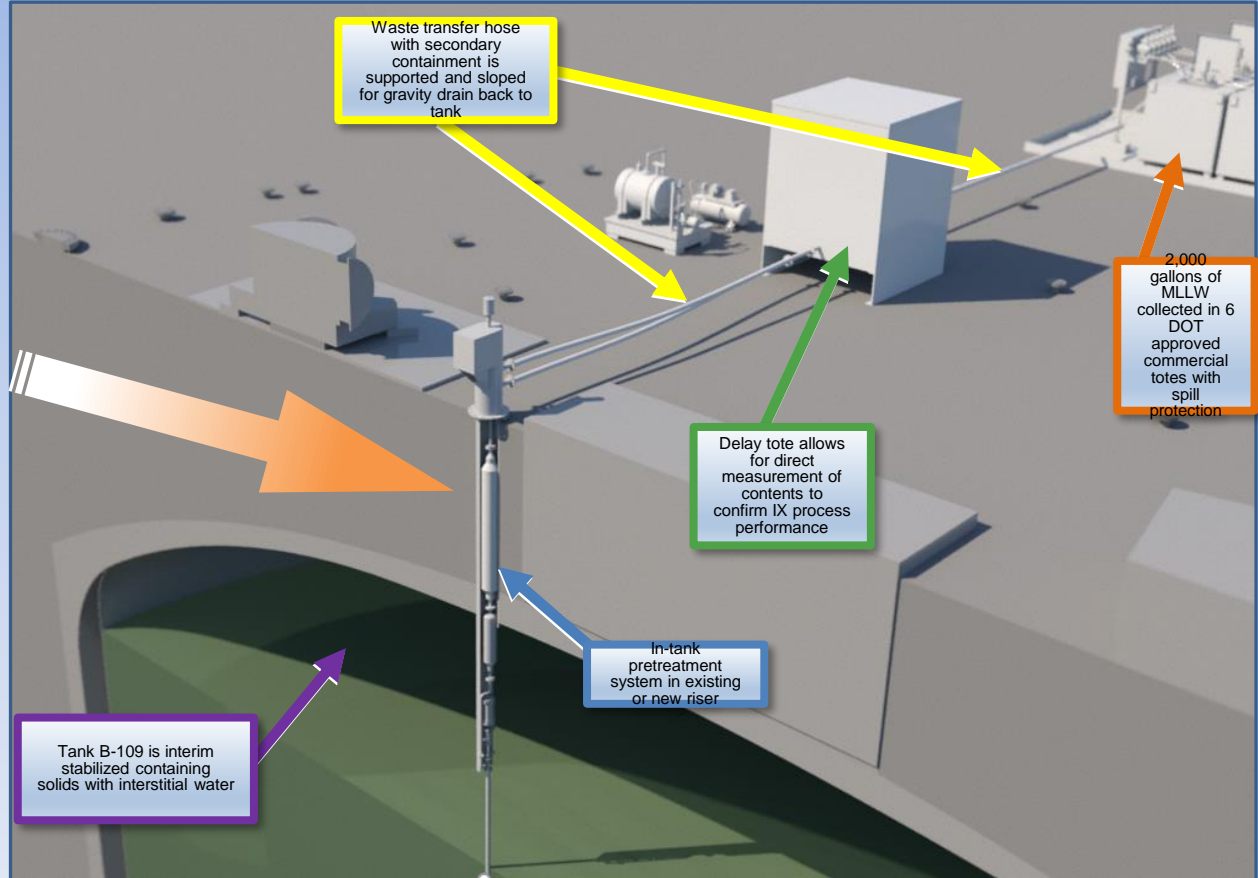
- System is a rigid assembly installed in a single 12" riser in a single lift
- Waste transfer hose with secondary containment during transfer to shipping container. Hose run expected to be less than 100 feet.
- IX column is in riser, simplifying operational and nuclear safety evaluations
- Filtration in-line before IX column protects column
- MLLW to delay tote for IX performance confirmation measurement then to DOT approved tote, with secondary containment shielding and overflow



## ITPS in Test Stand



## Tank B-109 Field Deployment Major Components



# 241-B-109 In-Tank Pretreatment System Design Concept



## Key System Features:

1. NucFil filter for hydrogen venting contamination control
2. 12" riser adapter with line out to transport totes and line in for backflush and venting of loaded IX column
3. Decontamination spray ring reduces contamination/dose in decommissioning
4. Ion exchange column w/CST resin separates  $\approx 175$  Ci Cs-137. Designed for decoupling and interim storage or disposal
5. Back-flushable cartridge filter to remove actinides and protect IX column
6. DC progressive cavity pump feeding system at approximately 1 gpm
7. Inlet strainer set into salt well in tank

## Pedigree and Status:

- Designed to Tank Farms Standards and Requirements
- Design Approved by TOC Contractor WRPS
- System successfully tested with simulants
- Hardware built and delivered to WRPS in 2019
- Available as part of B-109 or any SST Leak response



# Rationale for Immediate Action

- DOE reported for 15 years that the DIL in Tank B-109 was 23,000 gallons, and then reduced the amount in Monthly Summaries to 14,000 gallons despite recording increases in liquid in the quarterly readings.
- When DOE finally released its formal notice of a leak coming from Tank B-109 they reported ~3,100 gallons had leaked.
- DOE's own documents show that in reality at least 5,750 and as much as 10,000 gallons have leaked.
- USDOE knowingly omitted, and reported misleading, information in the formal leak notice report and the Waste Tank Summary Reports. The Reports are relied on by managers and regulators. The Summary Reports show far less Drainable Interstitial Liquid than there is in B-109. This has led some policy makers to erroneously say there is only a small amount available to leak.
- Allowing Tank B-109 to leak endlessly violates Treaty rights

# Hanford Advisory Board suggested policy level advice

1. Tank leaks must not be ignored. The harm caused is irreversible, which is why billions are being spent to remove and treat tank waste.
2. It is not acceptable for evidence of leaks to go without action for years. Borehole logging and ex-tank monitoring around suspect / high risk tanks should be required.
  - A new contingency plan that is transparent and includes regulators and Tribes needs adoption
  - If continue to use a “team” to formally determine if there is a tank leak, add WA, OR, Tribal rep to team
3. Leakable liquids should be removed from tanks as quickly as possible when there is evidence of leakage. Removing liquid is the best technical and required legal option.
4. USDOE should proceed to use the available “SAFE” technology and methods to remove leakable liquids from B-109 using equipment developed for TBI and similar to TSCR. Demonstrate use of existing “In-Tank Pretreatment System” with ion exchange to remove Cesium before leakable liquid is pumped from tank. Demonstrate offsite treatment of the removed liquid waste and offsite disposal.
  - This option is low cost and does not require long timelines and cost to install infrastructure in tank farm
  - If demonstrated successfully, order additional mobile units – may include second TSCR.
  - Additional mitigation or abatement such as intrusion control should be in addition to liquid removal

# Pumping to Remove Waste from leaking B-109 is the only legal and the only effective option

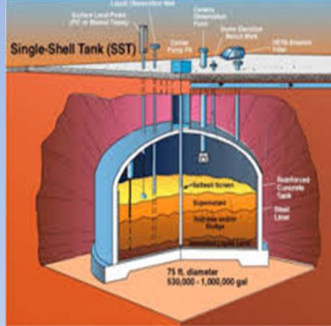
USDOE adopted a document for technologies to use for responding to Single Shell Tank leaks, which proposes running air over the surface of the tank waste to dry out supernatant and some of the drainable Interstitial Liquid (ILL). RPP-RPT-62098 (May 2020). The report acknowledges that this is not proven to have any long-term reduction in leakable interstitial liquid, requires constant venting until the tank is emptied, and creates air emissions with permitting challenges. RPP-RPT-59273 (2017).

- Removal of waste - starting with supernatant and drainable liquid - is the only effective way to end the leak from B-109.
- USDOE's own TPA required assessment (RPP-RPT-62098) co-recommended removal of drainable liquid as preferred approach: "The recommended drainable liquid removal technology is effective for both supernatant and drainable interstitial liquids in the SSTs." However, USDOE "preferred" ventilation based on subjective ranking without any external views, without consideration of regulatory requirements, and despite the report finding: "The effectiveness of single-pass ventilation systems in reducing drainable interstitial liquid is not known."

# Washington State Department of Ecology should take action reflecting Washington's "Zero Tolerance" Policy for tank leaks and the legal requirement to empty leakable liquid::

- Issue an order to USDOE to immediately begin to remove drainable interstitial liquids
  - Implement the SAFE TBI technology on Tank B109
  - Removal planning must begin immediately with physical removal of supernatant and liquids
- Order USDOE to include funding to respond to the leak in B-109 in the site budget and overall USDOE budget request and to provide Ecology and the public with all documentation on work costs to accomplish this and how USDOE prioritizes this work in its Budget Request.
- Demand that USDOE accurately report the quarterly readings in the administrative record within the Waste Tank Summary Reports
  - Convene an interdisciplinary review team with Tribes to review the leakage data and responses to leaks; and, not accept the USDOE's report selecting air ventilation as the response to leaks instead of removal.
- Resume borehole logging and add monitoring for leakage around each SST that is considered at high risk
- Have Ecology on formal team assessing if a tank is leaking (plus Oregon and Tribal experts to broaden team)
- Refer to the Attorney General for legal action USDOE's failure to report the leak for several years, misrepresentation of the leak quantities and failure to take action to remove wastes and abate the harm.

**Easy to install system  
in riser of B-109 to  
retrieve liquids before  
they leak**



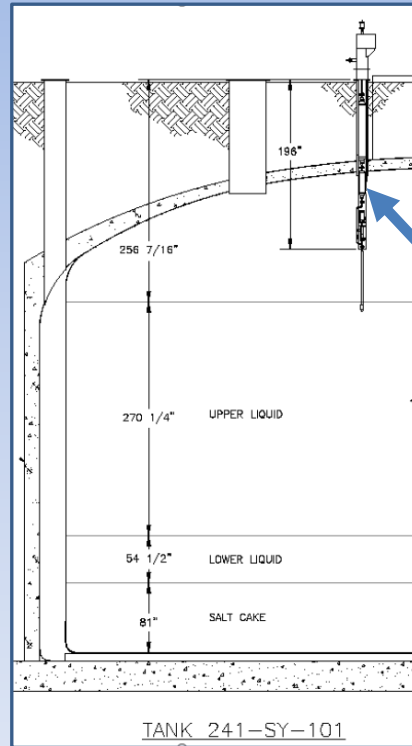
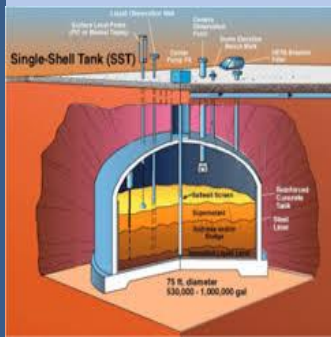
## **Tank B-109 Waste Retrieval and Pretreatment Key Features – support slides**

### **Key Features**

Approach is like the one used for interim stabilization of SSTs (i.e. removal of liquids)

- USDOE has greatly improved salt well pumping capability – put pump and salt well into B-109 and can retrieve far more liquid than when tanks were interim stabilized 20+ years ago.
- Leverages systems and components already developed and tested for a similar application in other tanks
- Allows retrieval and pretreatment of ~2000 gallons of interstitial liquid waste before it can leak to the environment
- If demonstration of first 2000 gallons of interstitial liquid waste is successful, continue to remove all interstitial liquid from B-109.
- Low personnel, operations and environmental risk
- Pretreatment of the liquids is done inside the tank, simplifying operational and nuclear safety evaluations
- Lab analysis of retrieved waste is verified to be MLLW before treating to RCRA standards followed by out of state disposal
- Big benefit – waste is not disposed in Hanford IDF landfill and is first reduction in total on-site contaminant load
- Approach enables DOE to have a ready and tested means for addressing future SST tank leaks as infrastructure continues to age and more tanks leak
- When ion exchange resin is expended, it gets pulled out and a new ITPS installed. Cost approximately \$150,000.

# In-Tank Pretreatment System Typical Tank General Arrangement

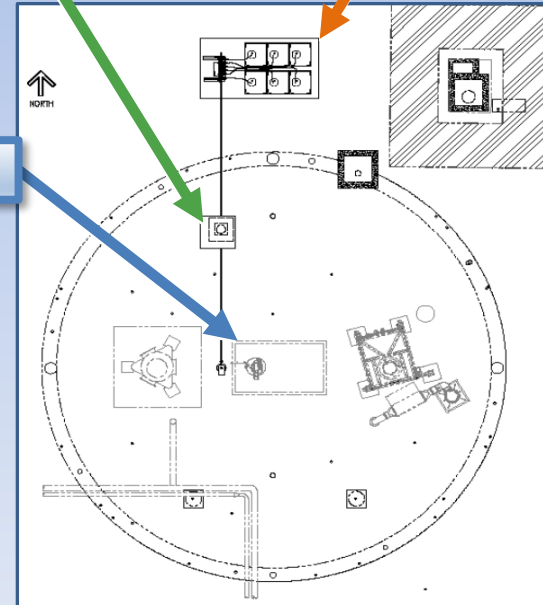


Typical Tank Elevation  
B-109 has solids only

Delay tote allows  
for direct  
measurement of  
contents to  
confirm IX process  
performance

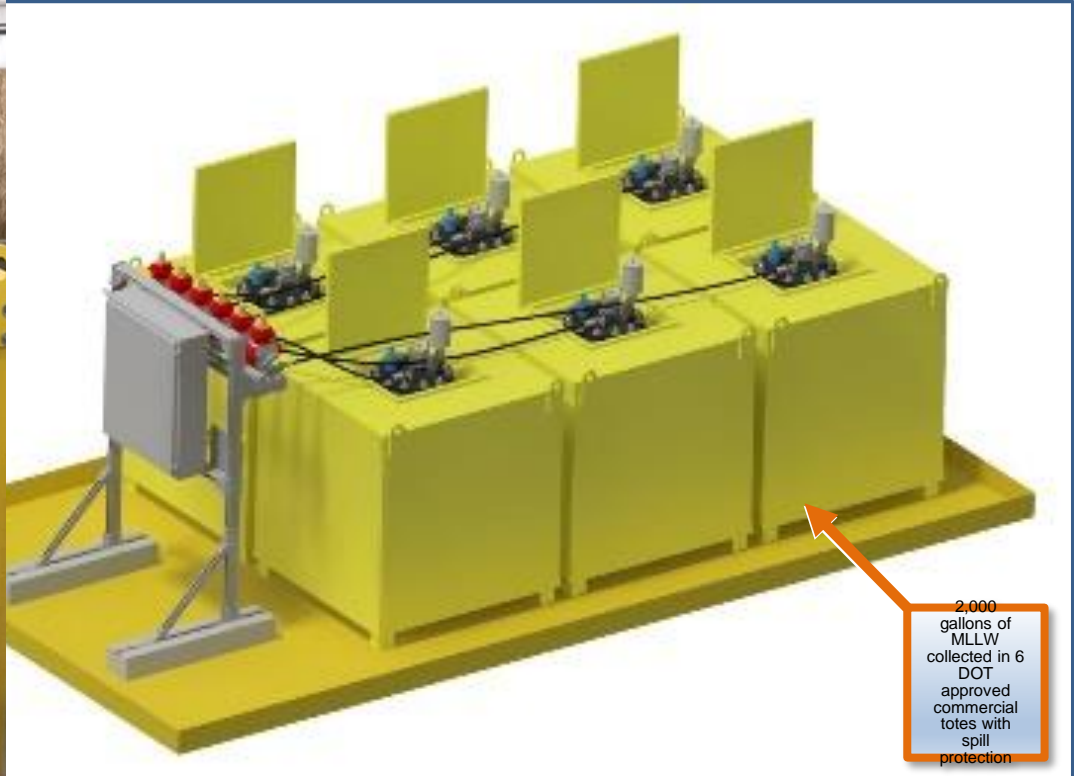
In-tank  
pretreatment  
system in new or  
existing riser

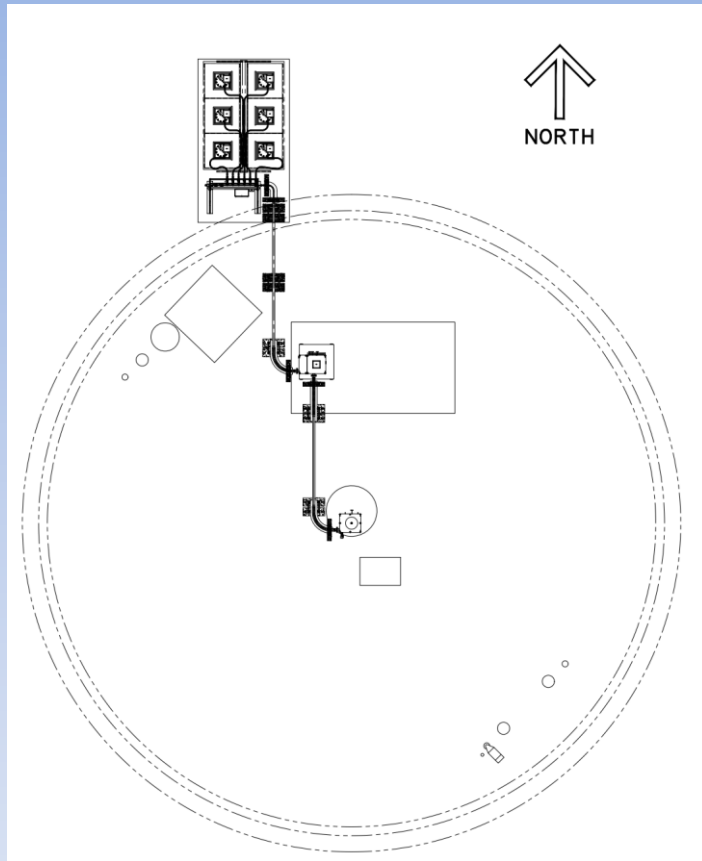
2,000  
gallons of  
MLLW  
collected in 6  
DOT  
approved  
commercial  
totes with  
spill  
protection



**Fabricated DOT  
Certified Totes**

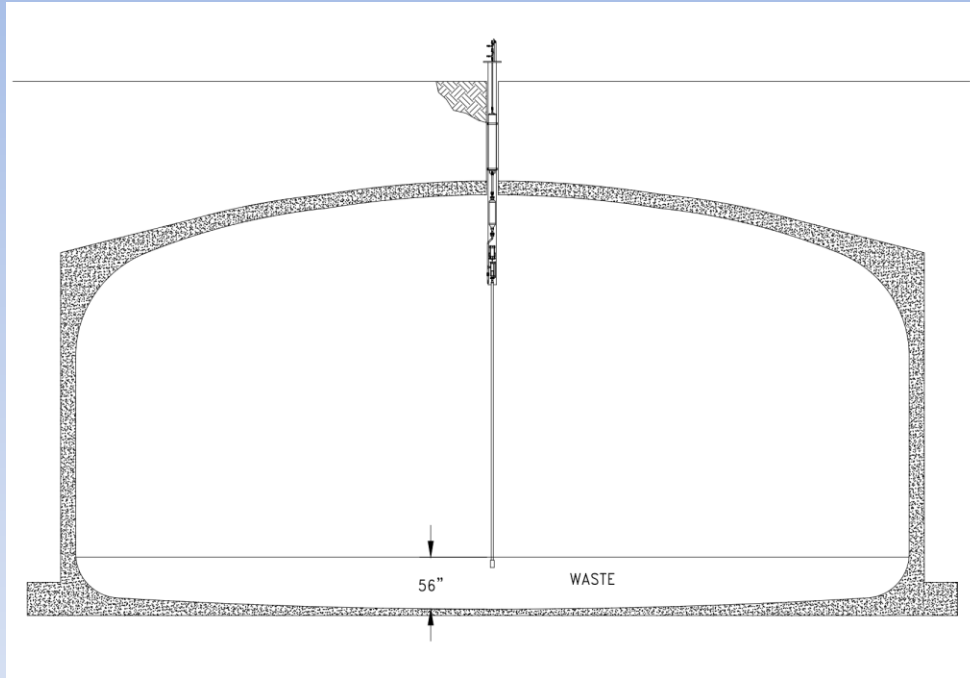
## Tank B-109 Commercial LLW Totes





Proposed Layout on Tank B-109  
Plan View



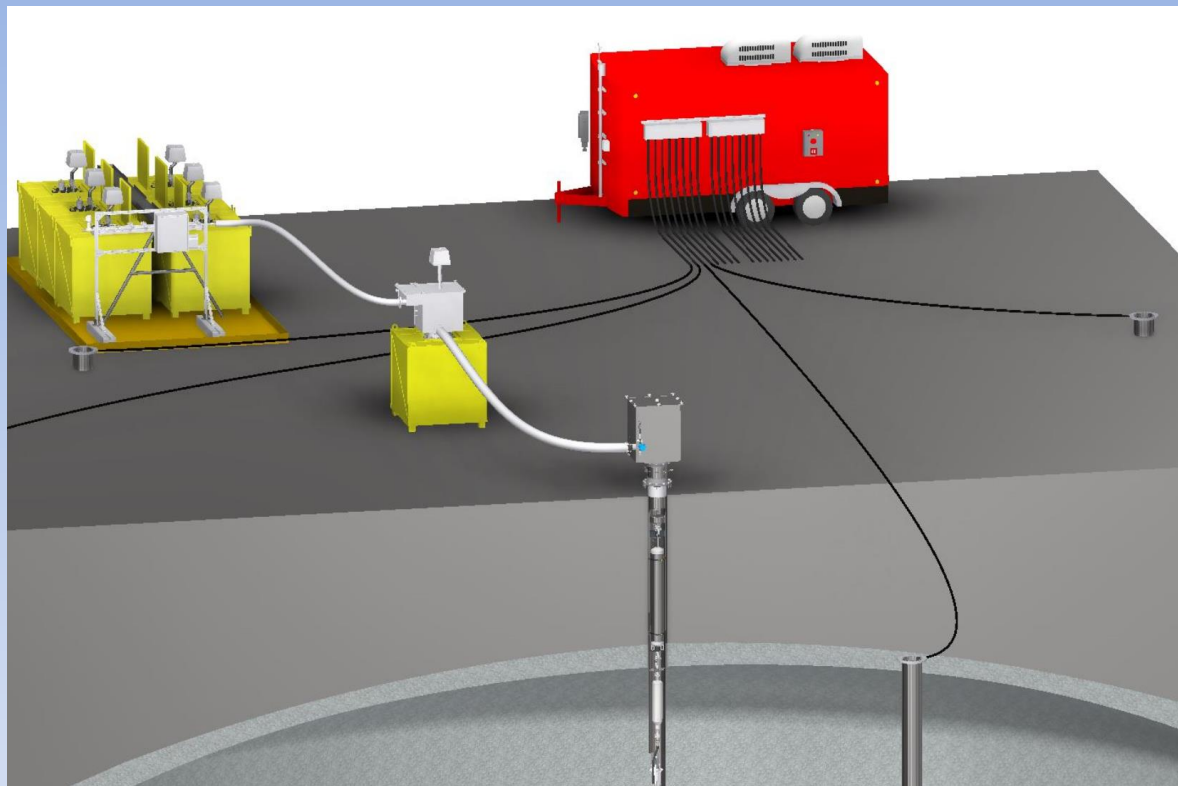


ITPS located in central riser in B-109  
-Elevation

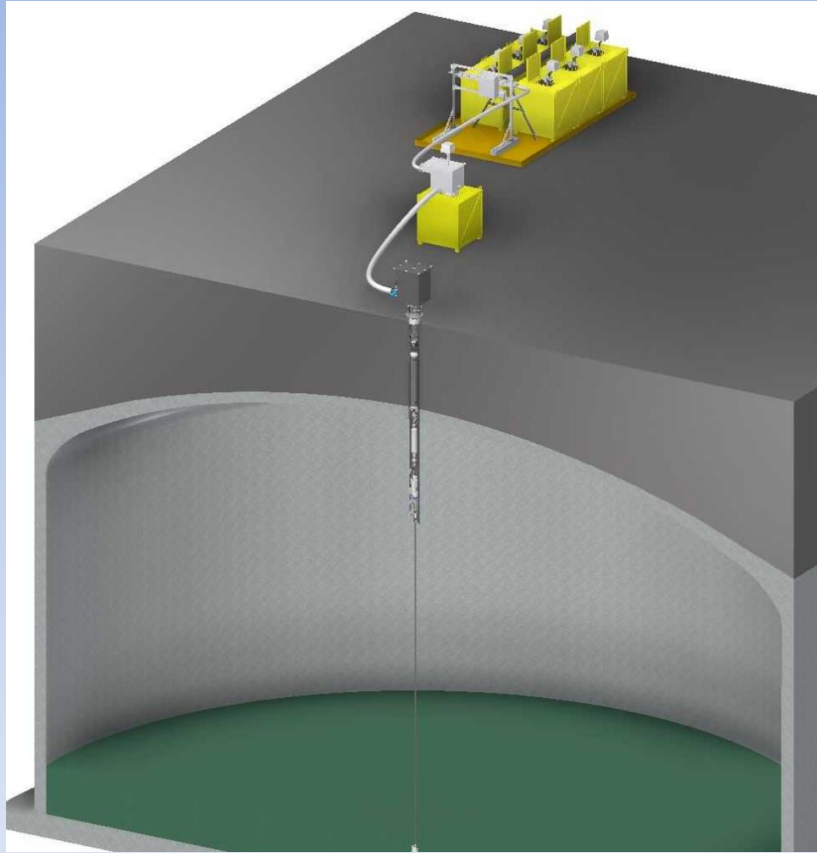


HRR-LDM trailer for detecting leaks on B-109

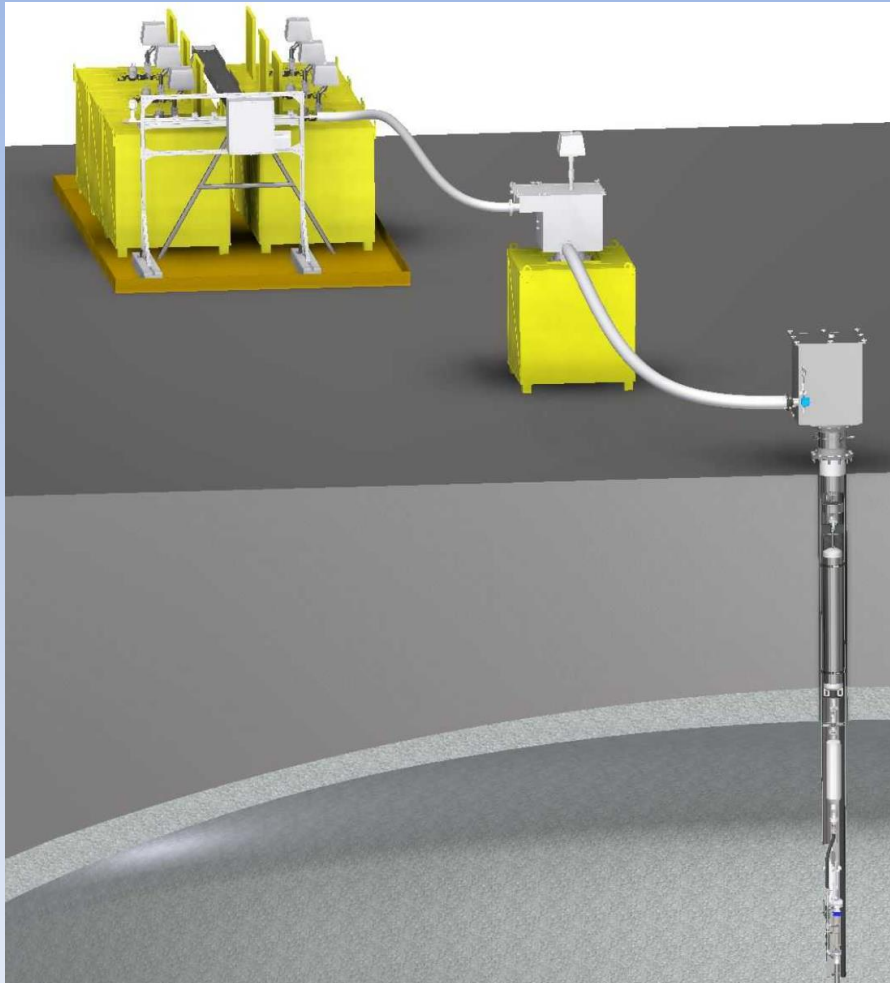
- initial condition
- changes during ITPS operation
- Critical to assessing risk



HRR-LDM and ITPS installed at B-109



ITPS on B-109

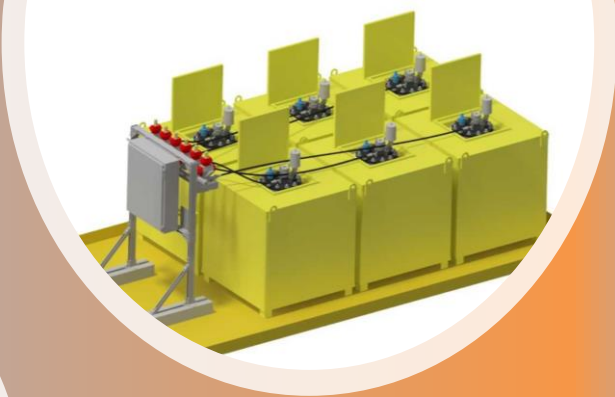


ITPS on B-109



ITPS – in tank stack up – pump/filter/IX/containment

- USDOE has this on hand.
- When ion exchange resin is used up, the arm and column are pulled from tank. Resin and column stored along with TSCR resins.
- New column can be procured and ready long before first one is full
- Cost in range of \$150,000



ITPS Process Totes –  
Staged For  
Characterization And  
Offsite Shipment